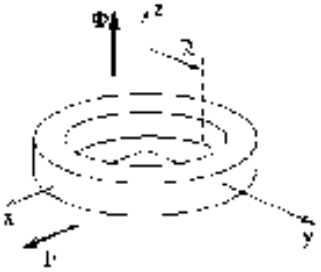
NER: Enhanced Magnetoabsorption Oscillations in Semiconductor Nanorings, David S. Citrin, Georgia Institute of Technology, DMR-0303969

There has been intense interest in classes of metamaterials in which magnetic properties may be exhibited in otherwise nonmagnetic materials. In this program, we consider theoretically the use of electric and optical fields to induce magnetic properties in intrinsic semiconductor nanoscale rings, i.e., nanorings (NR's).[1]

The small figure gives a diagram of the geometry,while the large figure on the right shows the change in the optical absorption with magnetic and electric field.



Schematic diagram of NR indicating direction of magnetic flux Φ and electric field F.

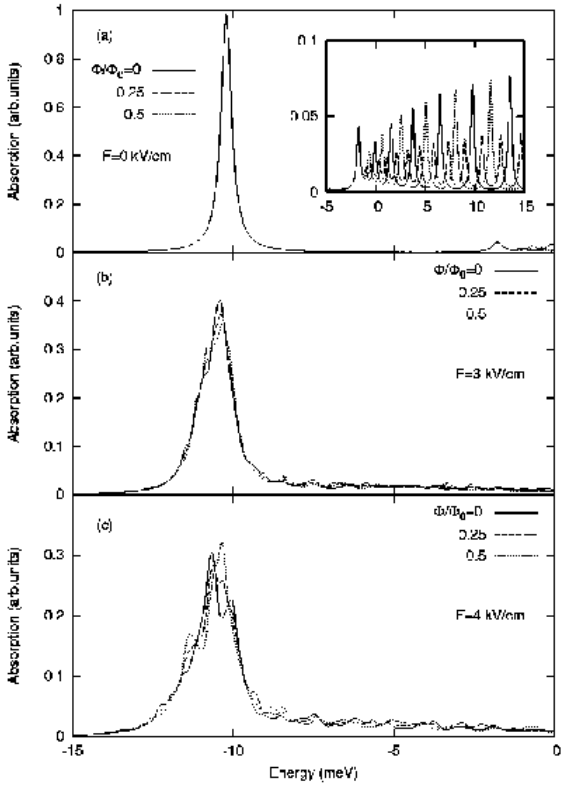


FIG. 3. Optical absorption of NR with excitonic effects for different F and Φ. In (a), all curves are superimposed for energies below the band gap.

1. A. V. Maslov and D. S. Citrin, Phys. Rev. B **67**, 121304 (2003).

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Technological Impact:

Magneto-optic sensing relies largely on classes of garnets. These materials are not readily integrated with semiconductor photonics, optoelectronics, and electronics. The nanorings, however, may be integratable with these technologies. We have shown theoretically ~10 % modulation of the optical properties varying the magnetic field by ~0.1 T.